



# Barometric Pumping with a Twist



**Developer:** Science & Engineering Associates, Inc.

**Contract Number:** DE-AR21-95MC32109

**Crosscutting Area:** N/A

Subsurface  
Contaminants  
**FOCUS AREA**

## Problem:

The majority of the planned remediation sites within the DOE complex are contaminated with volatile organic compounds (VOCs). In many instances, the contamination has not reached the water table so it does not pose an immediate threat, particularly at sites with distances to the water table of hundreds of feet. Yet these sites will ultimately require remediation of some type, either by active vapor extraction, in situ thermal treatment, bioremediation, or excavation and ex situ soil treatment, at costs ranging from \$50K to well more than \$150K. In addition, many remediated sites sustain residual contamination because current in situ techniques are typically not 100% effective. These circumstances result in modest contamination of limited risk, which must still be controlled.

## Solution:

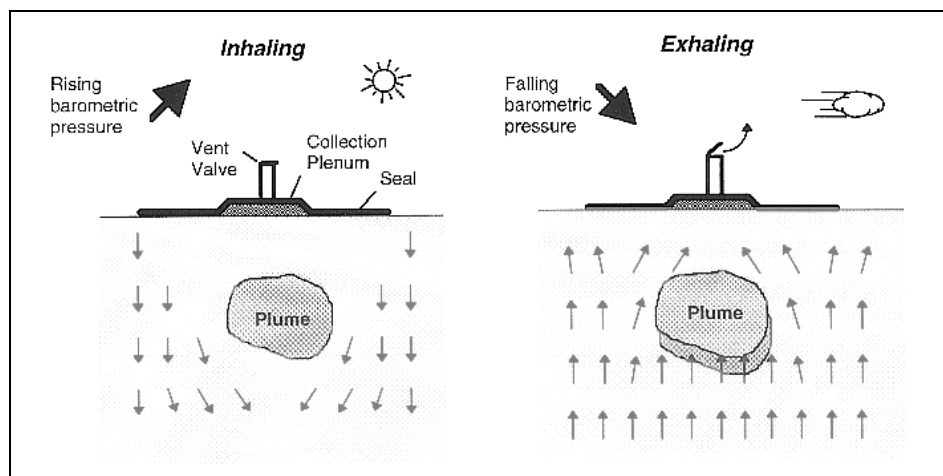
A low-cost, simple solution is being developed as an in situ containment and extraction methodology for sites where the contamination

resides in the vadose zone soil. The approach capitalizes on the vertical soil-gas movement resulting from natural barometric pressure oscillations, and harnesses this mechanism to ensure a net vertical upward soil-gas flux in the contaminated soil. The design is notable in that it requires no boreholes or site power, resulting in a low-cost, low-maintenance remediation system.

This technology is applicable to sites where the contamination is volatile under standard conditions, resides close to the soil surface and above the water table, and the water table is not shallow

## Benefits:

- ▶The system prevents soil vapor flow down to the water table by ensuring a net upward movement of soil gas in the contaminated soil.
- ▶No boreholes are required for the remediation/containment process.
- ▶The vented air, since this is a slow process, is of sufficiently low contaminant concentration that it can probably be released to the air with no treatment.
- ▶The design is very low cost since it does not require boreholes, excavation, site power, or an active off-gas treatment system.



►Virtually no hazardous waste is generated.

### Technology:

This remediation technology relies on the naturally occurring variations in barometric pressure. These oscillations are both diurnal, corresponding to daily heating and cooling of the atmosphere, and of a longer time period (several days), resulting from passage of weather fronts. As the barometric pressure rises, a gradient is imposed on the soil gas which drives fresh air into the soil. As the barometric pressure drops, gas vents upward from the near-surface soil into the atmosphere. Displacement of soil gas can be controlled using surface features which impede the downward movement of vapor in the plume area, but allow upward movement. The proposed design incorporates a surface seal, a plenum, and an extraction vent valve. In operation the system ratchets the upward soil gas flow by allowing normal upward flow during barometric lows but restricting downward air flow during high pressure cycles.

### Contacts:

Science and Engineering Associates, Inc. (SEA), is a high-technology contract R&D organization providing services to the national needs. The Environmental Technologies Division of SEA develops, demonstrates, and provides field services in the areas of environmental characterization, monitoring, and remediation. For information on this project, the contractor contact is:

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DOE's Morgantown Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

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